

幼児期における運動発達への遺伝と環境の影響

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Genetic and Environmental Effects on Motor Development in Early Childhood

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Abstract

Individual differences in motor development are the result of several interactive influences or factors, e.g. genetic, social, and psychological factors. The first step to be taken to unravel these differences is the quantitative analysis of contributing genetic factors and common or specific environmental factors in the variation of these phenotypes. The heritability of physical fitness and motor ability has been widely investigated, but a few studies attempt to distinguish between genetic and environmental effects.

The main purpose of the present study was to estimate the relative contribution of genetic and environmental effects on motor development in early childhood using model fitting analysis. A genetic model for data from twins reared together was applied. The model represented additive genetic effects (A), dominance genetic effects (D), common environmental effects (C), and specific environmental effects (E) on phenotypes of motor development. The subjects consisted of 46 pairs of monozygotic (MZ) and 22 pairs of dizygotic (DZ) twins from 3 to 6 years of age. The ratings of children's motor development were investigated via mother report questionnaires. Factor analysis resulted that motor development was divided into coordination – flexibility ability and physical power ability.

Correlation analysis showed that MZ correlation was higher ($P < .05$) than DZ correlation for coordination – flexibility ability. Where values for physical power ability were insignificant. However, all values in DZ twins were higher than the half of values in MZ twins. The model fitting analysis revealed that the major proportion of the total variance for motor development of coordination – flexibility ability and physical power ability was explained by the common environment, whilst a low proportion was explained by additive genetic factors. These results suggested that Individual differences of motor development were influenced more by common environmental factors than genetic factors. Common environmental factors were involved into the process of early motor development.

Key words: motor development, genetics, environment, twin study, early childhood